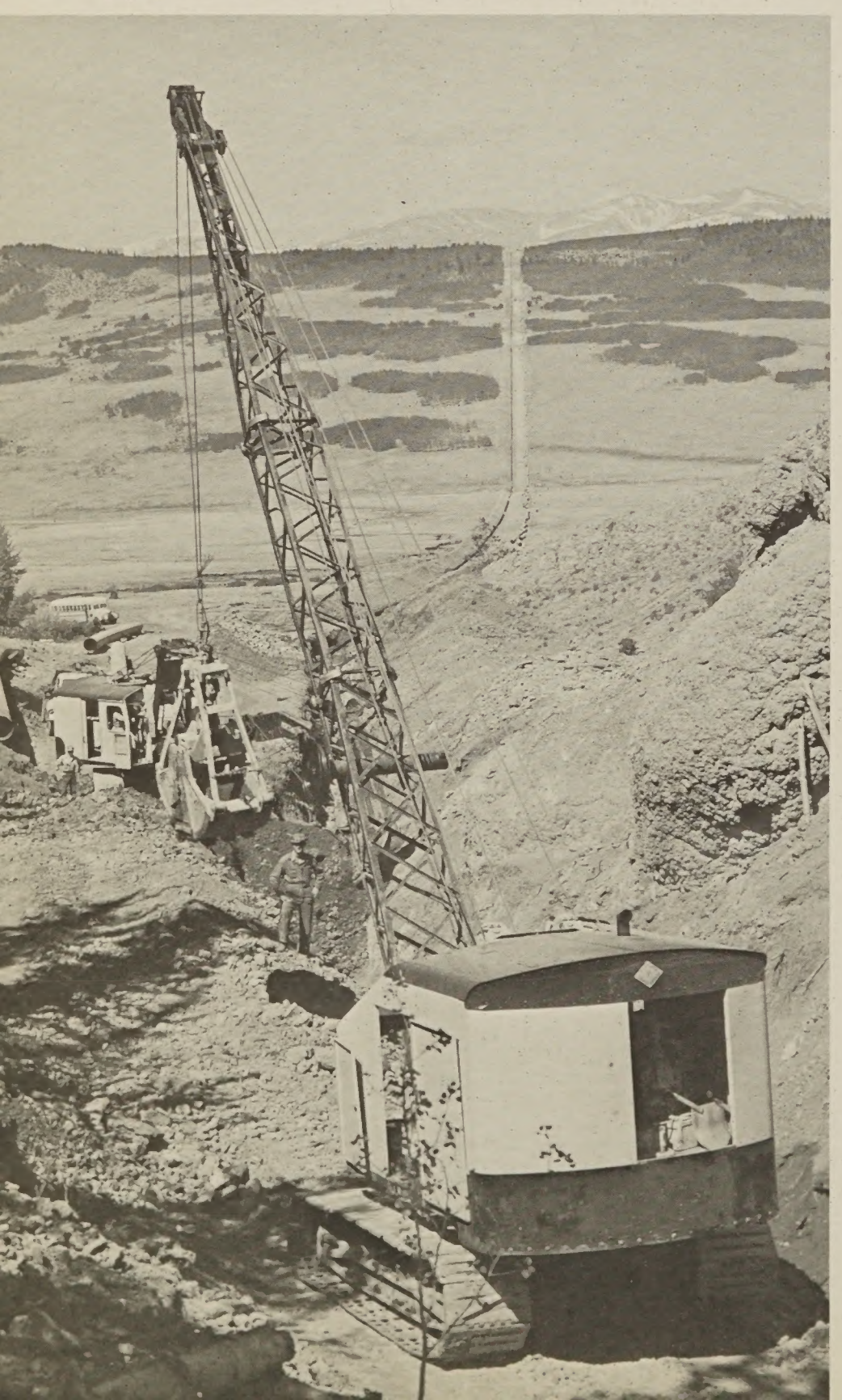
BITUMASTIC®
PIPELINE
COATINGS
BY KOPPERS

Even above ground, coal-tar base coatings completely protect petroleum product pipelines at this southwestern refinery.

Bitumastic Enamels provide corrosion protection for large-diameter pipeline which transports water from distant Rocky Mountains.



PIPELINES . . .

Since the late 1930's, gas transmission and distribution lines, crude and product petroleum lines have multiplied to represent a multi-billion dollar investment. In the years since World War II, total industry investment has amounted to more than twice the entire plant capitalization in 1945. And by 1970, an estimated 900,000 miles of gas pipeline alone will carry this economical fuel from wellheads to more than 44,000,000 consumers.

The development of steel pipe, first sectioned and riveted, now seamless and welded, has proved a boon to the pipeline industry. But with all the advantages of steel came its major disadvantage—vulnerability to corrosion—a problem that grows with each dollar of pipeline investment.

Public enemy number one is corrosion. The vast investment in underground pipelines is growing almost daily, and this expansion increases the corrosion problem. Some day there may be an economical, completely corrosion-proof metal pipeliners can use, but until then, the industry must protect its pipeline investment with the best, most economical means available.

What is the best insurance against the corrosion problem? A small additional investment is all that is needed to safeguard the huge amounts of capital involved in buried pipelines. Experience and service records have proved that maximum corrosion resistance at minimum expense is obtained by a combination of protective coatings and cathodic protection. And coal-tar based Bitumastic Pipeline Coatings not only reduce cathodic protection costs, but they retain their protective qualities longer than other coating materials.

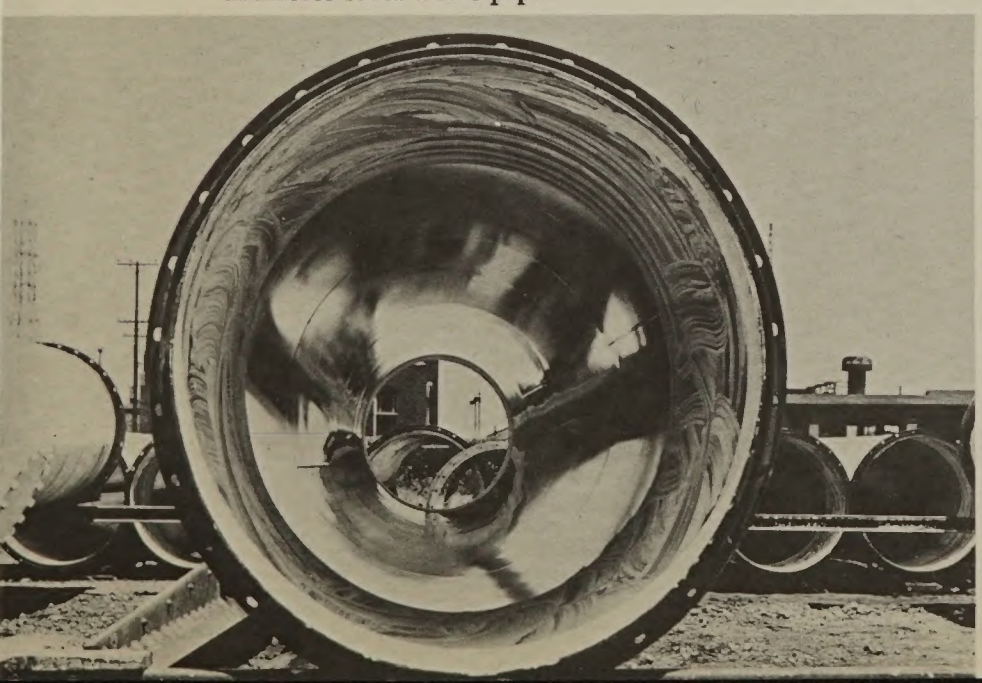
Underground natural gas storage tanks like these, used to shave peak loads in a large utility service area, also require corrosion protection of Bitumastic Enamels.

a tremendous and growing investment

These are the facts behind the protective properties of Bitumastic Enamels, facts that explain the continued excellence of their performance records. The HIGH WATER RESISTANCE of Bitumastic Enamels is due basically to the great strength and chemical stability of the benzene ring, building block of coal-tar molecules. These complex, aromatic structures retain their waterproofing ability for much longer periods of exposure than do the molecular structures of non-bituminous coating materials. Ring-like coal-tar molecules are also CHEMICALLY INERT to the corrosive attack of soil chemicals. Continued HIGH ELECTRICAL RESISTIVITY is another characteristic of Bitumastic Enamels, important to keeping costs of cathodic protection low, both initially and over the years of operation. Recent field and laboratory studies revealed that these coatings also possess RESISTANCE TO BACTERIAL ATTACK. Among all coating materials tested to date, coal-tar enamels are the only ones not attacked by soil bacteria. POSITIVE, PERMANENT ADHESION between pipe and coating is yet another advantage. No matter how you look at it, the best, most complete protection for pipeline investment is Bitumastic Coal-Tar Enamel.

Other uses of Bitumastic Coal-Tar Enamels are wherever thick, heavy-duty protection is required. Hot-applied in 100-mil thicknesses, tough protective films of Bitumastic Enamels give longer-lasting service than cold-applied materials. They resist abrasion exceptionally well, making enamel coatings ideal for penstocks, steel piling, and underground fuel storage tanks. In fact, any surface where periodic maintenance is impractical is a job for Bitumastic Enamels.

Smooth-as-glass Bitumastic Enamel lining will insure free flow and long service life for this large diameter steel water pipe.



On level or gently sloping terrain, ditching machine quickly digs pipeline trench and spews out earth in continuous operation.

BITUMASTIC PRIMERS . . .

What primers must do—they must provide permanent, maximum adhesion between the pipe wall surface and its protective enamel coating. Unless the primer *retains* the important bonding property, enamel is soon lost and the pipeline becomes exposed to attack. This long-lasting bond is attained at the primer-enamel interface. As hot enamel is applied to a primed surface, two simultaneous actions occur: (1) the hot enamel melts the primer at the interface and (2) enamel blends with the fused primer, forming a homogeneous primer-enamel zone. As the coating cools, a strong, permanent bond forms in this zone, and the protective enamel is "locked" to the primed surface.

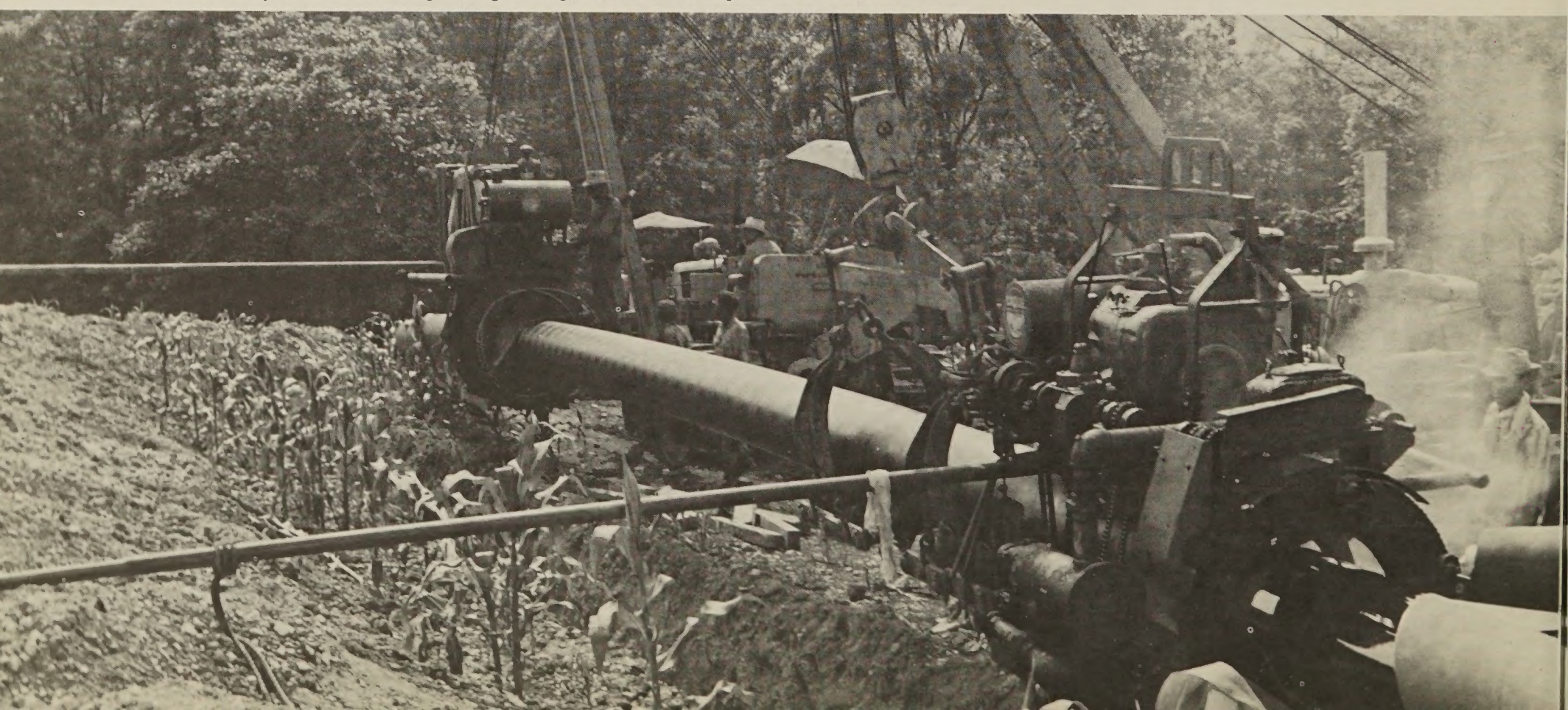
Koppers has formulated four grades of Bitumastic Primers. For each Bitumastic Enamel, there is a compatible Bitumastic Primer specially selected and formulated to give permanent, maximum adhesion. Each drum of Koppers Bitumastic Priming Solution is color-matched to correspond with its correct Koppers Bitumastic Enamel companion.

BITUMASTIC JET-SET PRIMING SOLUTION

Bitumastic Jet-Set Primer is a cold-applied liquid coating specifically developed by Koppers for use where rapid drying is of great importance. This quick drying property, permitting almost immediate application of enamel, speeds up the entire coating operation. The coating and wrapping machine can follow directly behind the cleaning and priming unit. And rapid drying means that skidding the pipe after priming is eliminated. Bitumastic Jet-Set is also valuable because it permits rapid repairs and backfilling, reducing public inconvenience due to interrupted service and road detours. This newest of Koppers Primers has proved itself under very unfavorable conditions where the use of conventional primers would have caused extended delays in job completion, if not actual work stoppages. Field experience has already indicated that Jet-Set retains its outstanding bonding characteristics for months, where ordinary priming solutions have a useful life of only a few days.

The versatility of Bitumastic Jet-Set lies in its wide range of successful applications. It can be applied under Bitumastic 70-B, No. 2 or XXH Enamels when the undercoating must dry faster than other primers. Bitumastic Jet-Set is also suitable for use as a shop coating on clean, blasted surfaces for protection until field coating is applied. It may be applied either by hand brushing or mechanical spraying, resulting in a strong, superior bond despite deviations from standard cleaning practice.

Rapid drying of Bitumastic Jet-Set allowed coating and wrapping machine to directly follow cleaning and priming machine through this cornfield.



key to permanent underground protection

Side-boom tractors perform pipe stringing operation and place each section alongside ditch.

Bitumastic Jet-Set Primer has these characteristics—	
Weight per Gal (Lb) weighing cup	10.2 min-10.8 max
Flash Point (°F) ASTM D1310	80 min
Ash Content (%) ASTM D1010	0.5 max
Water Content (%) ASTM D95	0.5 max
Drying Time to Touch (Min) 25 °C at 50% rel hum	10 max

There are three other grades of Bitumastic Primers; each is composed of a refined coal-tar pitch and solvent base. These primers and their companion Bitumastic Enamels are—

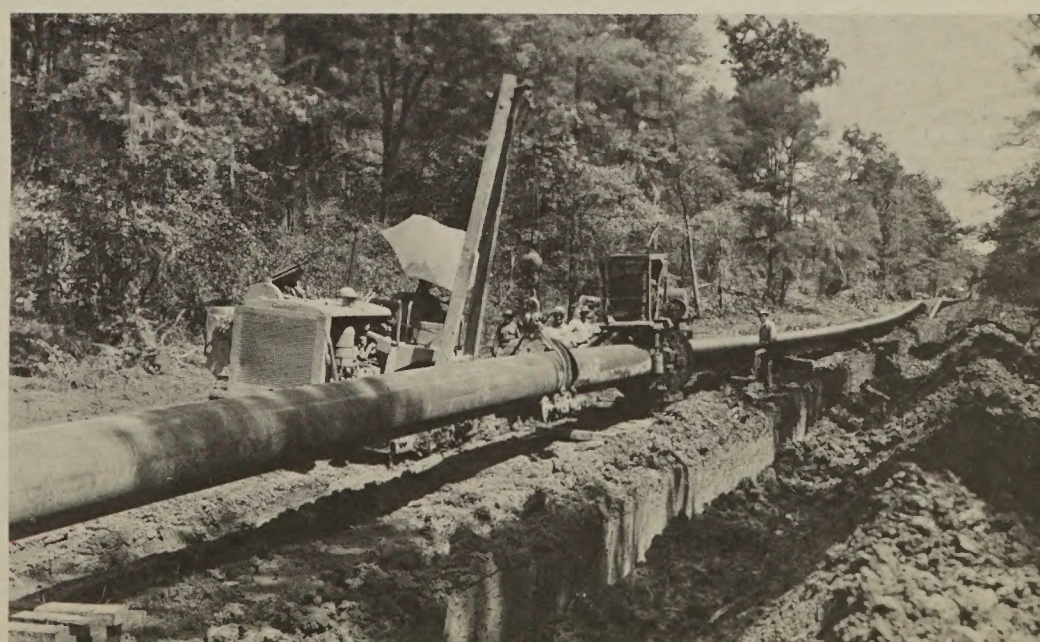
BITUMASTIC 70-B PRIMING SOLUTION . . . formulated for use with all three types of Bitumastic 70-B Enamel and Bitumastic Hi-Melt and Hi-Temp Enamels. *(refer to pages 7 and 9)*

BITUMASTIC NO. 2 PRIMING SOLUTION . . . formulated for use with Bitumastic No. 2 Enamel. *(refer to pages 7 and 9)*

BITUMASTIC PRIMING SOLUTION . . . formulated for use with all three types of Bitumastic XXH Enamel and Bitumastic Regular Enamel. *(refer to pages 7, 8, and 9)*

Welder joins each pipe section, transforming separate strings into continuous transmission line.

Side-boom tractor lifts pipeline for cleaning and priming machine; coating and wrapping follows this operation.



BITUMASTIC ENAMELS

...a correct selection for every job

HOW TO USE THE SELECTOR...

Bitumastic Enamels differ chiefly in the variations of atmospheric or service temperature ranges they will withstand, either without cracking from prolonged exposure to cold, or sagging from sustained heat. The temperature exposure ranges given below and in the preceding section were established under a controlled laboratory environment. In the field, any combination of rough handling, sudden temperature variation, or uneven heating of the Enamel, will cause a corresponding change in the safe handling temperature of an Enamel.

ENAMEL KOPPERS SELECTOR

CHARACTERISTICS	Bitumastic 70-B FF Enamel	Bitumastic 70-B STD Enamel	Bitumastic 70-B AWWA Enamel	Bitumastic Hi-Melt Enamel	Bitumastic Hi-Temp Enamel	Bitumastic No. 2 Enamel	Bitumastic XXH FF 190 Enamel	Bitumastic XXH FF 200 Enamel	Bitumastic XXH STD Enamel	Bitumastic Regular Enamel
S. P. (°F) ASTM D36 (R & B)	220-235	220-235	220 min	250 min	265 min	190-205	180-190	190-200	195-205	165-175
ASH (%) By weight by ignition	20-25	25-35	25-35	25-35	25-35	23-28	20-25	20-25	34-39	30-35
S. G. at 77°F ASTM D71	1.35-1.45	1.40-1.60	1.40-1.60	1.40-1.60	1.40-1.60	1.40-1.50	1.40-1.50	1.40-1.50	1.55-1.65	1.51-1.61
Penetration (ASTM D5) at 77°F at 115°F	4-9 12-25	4-9 12-25	10-20 15-55	2-7 8-23	7-12	2-7 10-25	0-2 2-8	0-1 1-6	0-2 3-8	0-4 17-32
SAG (1/16-in. max) AWWA C203-62	24 hrs at 160F	24 hrs at 160F	24 hrs at 160F	24 hrs. at 180F	24 hrs at 225F	5 hrs at 140F	5 hrs at 120F	5 hrs at 120F	5 hrs at 120F	5 hrs at 100F
Crack (none) AWWA C203-62	6 hrs at —10F	6 hrs at —10F	6 hrs at —20F	6 hrs at 0°F	6 hrs at 0°F	6 hrs at 0°F	6 hrs at 32F	6 hrs at 45F	6 hrs at 32F	6 hrs at 20F
Normal Application Temperatures (°F)	450-490	450-490	450-490	490-530	500-550	440-480	375-425	375-425	425-475	400-450
Temperature Exposure Range (°F)*	—10 to 160	—10 to 160	—20 to 160	0 to 180	0 to 225	0 to 140	32 to 120	45 to 120	32 to 120	20 to 100

*Surfaces coated with Bitumastic Enamels will withstand the abave temperature variatians provided the surfaces remain undisturbed.

. . . permanent, sure protection for pipeline investment

Over a century ago . . . in 1854 . . . Bitumastic Coal-Tar Enamels were born. It was a birth of necessity, for the wider uses of iron and steel created the need for some means of permanent protection against the intense attack of corrosive agents. From their beginning, coal-tar based Bitumastic Enamels gave unparalleled protection to steel ships and exposed water standpipes. Then, with 60 years of proved service already behind them, Bitumastic Enamels were first applied to a transmission pipeline. Today, with their excellent record of long-lasting protection, Bitumastic Enamels are used on many of the biggest pipeline jobs.

Koppers Tar Products Division's continuing research and development programs have resulted in an entire "family" of modern, high quality Bitumastic Coal-Tar Enamels. Each enamel is designed to meet specific field conditions encountered in pipelining, and each is produced under rigid control at every stage of formulation and processing. *On-the-job supervision by a Koppers application expert assures quality application.* These improved coating materials, coupled with modern application techniques, are the best protection system known for the nation's underground arteries of steel.

Bitumastic 70-B Enamel

This was the first wide-temperature-range bituminous coating ever produced—another Koppers first—and constant development and product improvements have given Bitumastic 70-B Enamel even greater protective qualities. There are three types of Bitumastic 70-B Enamel, each color-matched in *blue:*

FREE-FLOWING is specifically formulated for field application by line traveling coating and wrapping machines, since the required application is easily maintained under ambient field temperatures. It has a temperature exposure range of —10° to 160°F.

STANDARD is most popular for shop-coated pipe, where closer control of kettle temperatures is practical. It also has a temperature exposure range of —10° to 160°F.

AWWA is generally applied to water pipe and meets exacting AWWA specifications for this service. However, it finds application on gas and product pipelines when temperatures *lower* than —10°F are expected before backfilling. It has a temperature exposure range of —20° to 160°F.

NOTE: Bitumastic 70-B Enamel is manufactured to meet the various revisions of military specification MIL-P-15147. When certification of conformity to government specifications may be required, it is requested that this be stated in the order so that materials meeting specific revisions can be provided.

Bitumastic Hi-Melt Enamel

Koppers Tar Products Division coating specialists developed this Enamel and its companion, Bitumastic Hi-Temp, for use on hotlines leading from booster compressor stations. It retains strong adhesive properties on the exterior surfaces of buried steel pipelines which carry liquids or gases at continuous temperatures up to 180°F. When reinforced with glass fabric and asbestos felt outerwraps, Bitumastic Hi-Melt will resist intermittent temperature rises up to 200°F. It has a temperature exposure range of 0° to 130°F. Bitumastic Hi-Melt Enamel is supplied in *blue* drums.

Bitumastic Hi-Temp Enamel

On the exterior surfaces of gas or petroleum hotlines, Bitumastic Hi-Temp withstands continuous temperatures up to 225°F. With glass fabric and asbestos felt reinforcement, the service temperature of this Enamel increases to a temporary maximum of 250°F. It has a temperature exposure range of 0° to 225°F. Bitumastic Hi-Temp Enamel is also supplied in *blue* drums.

Bitumastic No. 2 Enamel

This coating material possesses some of the properties of both 70-B and XXH Enamels. While it is not as rubbery or plastic as 70-B, it does withstand cracking at lower temperatures than XXH. It is easily applied by either field or shop-coating equipment and has a temperature exposure range of 0° to 140°F. Containers of Bitumastic No. 2 Enamel are easily identified by their exterior *orange* color.

Bitumastic XXH Enamel

This is the hardest grade of Enamel at moderate atmospheric temperatures. It is especially formulated for use when wide temperature variations are *not* expected. There are also three types of Bitumastic XXH Enamel, each drum color-matched in *gray:*

FREE-FLOWING 190 is primarily applied by line traveling coating and wrapping machines. Its softening point of 190°F makes it suitable when weather conditions range from cold to warm. It has a temperature exposure range of 32° to 120°F.

Pipelines are often laid under extremely adverse conditions; protection must be complete under water and in poor soil conditions.

Before laying operation begins, pipeline is checked with holiday detector to make sure that flaws or pinholes do not exist in enamel and felt wrap.

Coated and wrapped stretch of pipeline now has long-life protection against attack of soil bacteria, moisture, and other underground corrosive agents.

FREE-FLOWING 200 is also best suited for application by field coating equipment. Its slightly higher softening point of 200°F makes it suitable for application when weather conditions range from warm to hot. It has a temperature exposure range of 45° to 120°F.

STANDARD is most often applied to shop-coated pipe that will not be exposed to cold weather or a wide temperature variation before backfilling. Its temperature exposure range is 32° to 120°F.

Bitumastic Regular Enamel

This grade has been in constant use longer than any other coal-tar base pipeline coating material. Many firms who were among the first to protect buried and exposed steel surfaces with Bitumastic Enamels still specify Bitumastic Regular Enamel. It is limited to application manually or by shop-coating equipment, and its temperature exposure range is 20° to 100°F. Bitumastic Regular Enamel is supplied in *gray* drums.

Last operation before clean-up of right-of-way is backfilling, here performed by side-boom tractor with drag hoe.

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KOPPERS COMPANY, INC.
TAR PRODUCTS DIVISION
Pittsburgh 19, Pa.

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